

Sorex preblei. By John E. Cornely, L. N. Carraway, and B. J. Verts

Published 10 December 1992 by The American Society of Mammalogists

Sorex preblei Jackson, 1922

Preble's shrew

Sorex preblei Jackson, 1922:263. Type locality "Jordan Valley, altitude 4,200 feet, Malheur County, Oregon."

CONTEXT AND CONTENT. Order Insectivora, Family Soricidae, Subfamily Soricinae, Tribe Soricini, Genus *Sorex*, Subgenus *Otisorex* (Findley, 1955; George, 1988; Hall, 1981; Junge and Hoffmann, 1981). No subspecies are recognized currently (Hall, 1981).

DIAGNOSIS. *Sorex preblei* is a very small shrew with grayish pelage on the dorsum and silvery pelage on the venter (Bailey, 1936; Larrison and Johnson, 1981). The I1 has a median tine, U3 is as large as or larger than U4, condylobasal length is 14.0-14.8 mm, and maxillary breadth is ≤ 4.2 mm.

Preble's shrew (Fig. 1) can be distinguished from sympatric congeners as follows: from *S. merriami* by the presence of a tine on the medial edge of I1, a maxillary breadth ≤ 4.2 mm, a condylobasal length ≤ 14.8 mm, a grayish dorsum, and a silvery-colored venter (Hoffmann and Pattie, 1968; Verts and Carraway, 1984); from *S. cinereus* by a condylobasal length ≤ 14.8 mm (Hoffmann and Pattie, 1968); from *S. haydeni* by a length of the mandibular toothrow < 4.2 mm; and from other *Sorex* by U3 being as large as or larger than U4 and the foramen magnum set low on the occiput (Ingles, 1965; Junge and Hoffmann, 1981; Larrison and Johnson, 1981). Additionally, it can be separated from *S. monticolus* by a much shorter mandible (< 6.6 mm) and *S. nanus* by the dentary below m1 being much deeper than the height of m1 at the metaconid and higher (> 2.9 mm) coronoid process (Mullican and Carraway, 1990).

GENERAL CHARACTERS. Like other members of the genus, *Sorex preblei* has a long pointed snout, small eyes, somewhat conspicuous ears, and pentadactyl plantigrade feet. The feet are buffy colored (Bailey, 1936). The tail is bicolored, olive brown above and hazel below darkening toward the tip (Bailey, 1936; Jackson, 1922). The tine on the medial edge of I1 is long, acutely pointed, and set within the pigmented area (Carraway and Verts, in press). The anastomosed infraorbital and lacrimal foramina in the zygomatic plate usually is positioned either even with (64.7%) or posterior to (29.0%) the mesostyle of M1 (van Zyll de Jong, 1991).

Sorex preblei is among the smallest members of the genus in North America (Fig. 1; Jackson, 1928). Ranges of external measurements (in mm) are: total length, 77-95; tail length, 28-38; length of hind foot, 7-11; and ear length, 8-11 (Armstrong, 1957; Hoffmann and Fisher, 1978; Hoffmann et al., 1969; Ingles, 1965; Jackson, 1928; Tomasi and Hoffmann, 1984; Verts, 1975). The range of recorded total weights is 2.1-4.1 g (Armstrong, 1957; Hoffmann et al., 1969; Tomasi and Hoffmann, 1984; Williams, 1984). Ranges of published cranial measurements (in mm) are: condylobasal length, 13.8-15.1; palatal length, 5.4-5.8; cranial breadth, 7.0-7.2; interorbital breadth, 2.9-3.1; maxillary breadth, 3.8-4.2; and length of the maxillary toothrow, 4.8-5.3 (Jackson, 1922, 1928; Hoffmann and Fisher, 1978; Ingles, 1965; Williams, 1984). Means ($\pm SE$) for a sample of 22 individuals from Oregon are: condylobasal length, 14.61 ± 0.07 ; length of mandible from posterior tip of lower condylar facet to tip of il, 8.43 ± 0.04 ; length of mandible from posterior tip of lower condylar facet to tip of metaconid of m1, 5.06 ± 0.02 ; coronoid-condyloid length, 2.72 ± 0.02 (Carraway and Verts, in press). The dental formula is i 3/1, c 1/1, p 3/1, m 3/3, total 32.

DISTRIBUTION. The geographic distribution of *S. preblei* (Fig. 2) appears as several disjunct populations, but this likely is as much a result of unequal sampling effort as a lack of continuity of occupiable habitats. The species was reported from several localities

in Montana (Hoffmann et al., 1969; Hoffmann and Fisher, 1978; Junge and Hoffmann, 1981) that include the northernmost and easternmost records. This shrew is known in Wyoming only from the northwestern and southwestern corners of the state (Hoffmann et al., 1969; Tomasi and Hoffmann, 1984). It occurs in southeastern Washington (Armstrong, 1957), central and eastern Oregon (Hansen, 1964; Jackson, 1922, 1928; Verts, 1975), west-central Idaho (Larrison and Johnson, 1981), northeastern California (Williams, 1984), and northwestern (Hoffmann and Fisher, 1978) and northeastern Nevada (Ports and George, 1990). The southernmost record



FIG. 1. Dorsal, ventral, and lateral views of the skull and lateral view of the mandible of an adult female *Sorex preblei* (OSUFW [Oregon State University Department of Fisheries and Wildlife] 3891) from 5 mi S, 14 mi E Frenchglen, T32S, R33E, Sec. 31, 7,300 ft, Harney Co., Oregon. Occipitonasal length of skull is 15.03 mm.

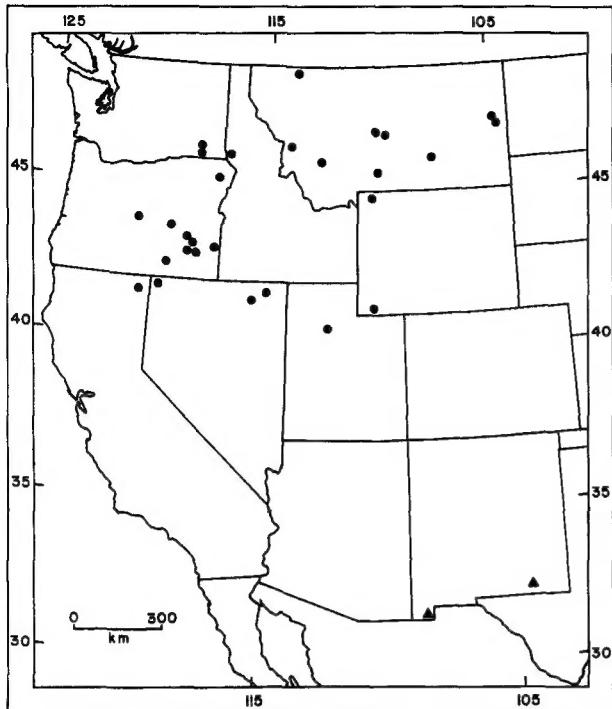


FIG. 2. Distribution of *Sorex preblei*. Localities for extant populations are indicated by closed circles; Late Pleistocene fossil localities (in New Mexico) are indicated by closed triangles. Map redrawn after Harris and Carraway (in press).

is from the south shore of Great Salt Lake (Tomasi and Hoffmann, 1984). Known altitudinal range is from 1,280 m in Oregon (Jackson, 1922) and Montana (Hoffmann and Fisher, 1978) to 2,347 m in California (Williams, 1984).

FOSSIL RECORD. Fossils of Preble's shrews have been found only in Late Pleistocene-age Dry Cave, Eddy Co., New Mexico, and U-Bar Cave, Hidalgo Co., New Mexico (Fig. 2; Harris and Carraway, in press).

FORM AND FUNCTION. The encephalization index of *S. preblei* was 4% less than that of the "average" for 10 taxa of western *Sorex* (Carraway and Verts, 1988). Indices of bite force indicated that of 12 taxa of western *Sorex* examined, *S. preblei* has the lowest capacity for piercing hard-bodied prey (Carraway and Verts, in press). At the tip of il and at the metaconid of ml, indices of bite force were 95 and 97%, respectively, of expected values based on condylobasal length of the 12 taxa (Carraway and Verts, in press). However, the lengths of the resistance moment arms (length of the mandible from posterior point of the lower condylar facet to tip of il and to the metaconid of ml) were 101 and 98%, respectively, of those expected based on condylobasal length. Also, the length of the muscle moment arm (coronoid-condyloid length) was 99% of that expected on the basis of condylobasal length. The reciprocal of the angle between the two moment arms was 103% of that expected on the basis of condylobasal length and 102% of that expected based on coronoid-condyloid length. Thus, the less-than-expected bite force in *S. preblei* was acquired by a slight lengthening of the mandible, shortening of the coronoid process, and a more acute angle than expected between them (Carraway and Verts, in press). Based on the less-than-expected bite force, the presence of long, acutely pointed tines, and the somewhat divergent Il's, Carraway and Verts (in press) predicted that the diet of *S. preblei* consists of soft-bodied prey.

ECOLOGY. Most Preble's shrews "... have been collected from arid to semiarid shrub-grass associations or openings in montane coniferous forests dominated by sagebrush" (Tomasi and Hoffmann, 1984:708); however, they do not seem to be restricted to these habitats. "In Jordan Valley [Oregon] Preble collected the type in a trap set near a willow-fringed creek out on the big Transition Zone meadows" (Bailey, 1936:368). Also in Oregon, Preble's shrews are known from marsh habitats (Bailey, 1936), sagebrush (*Artemesia*)-

dominated habitat (Verts, 1975), and dry bunchgrass (*Agropyron*) habitat (Hansen, 1956). In Washington, *S. preblei* was collected in grassland and sagebrush openings in subalpine coniferous forests (Hoffmann and Pattie, 1968; Hoffmann et al., 1969). Earlier, Armstrong (1957) collected *S. preblei* in communities of dense alpine fir (presumably *Abies*), lodgepole pine (*Pinus contorta*), lodgepole pine-huckleberry (*Vaccinium*), and white fir (*Abies concolor*)-spruce (*Picea*) in Washington. The sole specimen from Idaho was captured at a forest spring (Larrison and Johnson, 1981). In Montana, this species was collected in arid shrub-grassland habitats (Hoffmann and Fisher, 1978; Hoffmann et al., 1969). The only record from northern California (Williams, 1984) was from a site dominated by hoary sagebrush (*A. cana*) 40 m from a quaking aspen (*Populus tremuloides*) grove and ≥ 80 m from wetlands. Records from Nevada were from sagebrush-grassland characterized by big sagebrush (*Artemesia tridentata*), bluebunch wheatgrass (*Agropyron spicatum*), and Thurber needlegrass (*Stipa thurberiana*)—Hoffmann and Fisher, 1978; from seasonally wet, sagebrush-dominated communities characterized by big sagebrush, rubber rabbitbrush (*Chrysothamnus nauseosus*), antelope bitterbrush (*Purshia tridentata*); and from habitats characterized by perennial streams with willows, Wood's rose (*Rosa woodsii*), greasewood (*Sarcobatus*), and Great Basin wildrye (*Elymus cinereus*)—Ports and George, 1990. In Utah, Preble's shrews were collected in wet and alkaline habitat in which dominant vegetation was salt grass (*Distichlis*), pickleweed (*Salicornia*), iodine bush (*Allenrolfia*), and greasewood (Tomasi and Hoffmann, 1984).

Reported mammalian associates of Preble's shrews are *S. merriami*, *S. monticolus*, *S. cinereus*, *S. haydeni*, *S. vagrans*, *Tamias amoenus*, *Thomomys talpoides*, *Peromyscus maniculatus*, *Reithrodontomys megalotis*, *Clethrionomys gapperi*, *Lemmiscus curtatus*, *Microtus montanus*, *M. richardsoni*, and *M. longicaudus* (Armstrong, 1957; Hansen, 1956; Hoffmann and Fisher, 1978; Junge and Hoffmann, 1981; Ports and George, 1990; T. E. Tomasi, in litt.; Verts and Carraway, 1984; Williams, 1984). The only ectoparasites reported from *S. preblei* are the mite (Acari) *Androlaelaps fahrenholzi* and the flea (Siphonaptera) *Corrodopsylla curvata* (Hansen, 1964).

Preble's shrews have been collected in snap traps (Hansen, 1956); however, most have been captured in pitfall traps (Armstrong, 1957; Hansen, 1956; Hoffmann and Pattie, 1968; Ports and George, 1990; Williams, 1984).

GENETICS. A sample ($n = 2$) of *S. preblei* from Oregon had a mean heterozygosity of 0.06 and percent polymorphism of 19.23% based on 20 protein systems encoded by 26 presumptive loci (George, 1988). There is no published karyotype.

REMARKS. No published information is available on ontogeny and reproduction or behavior in Preble's shrew.

The generic name *Sorex* is derived from the Latin *soric* meaning shrew mouse (Jaeger, 1978). The specific name *preblei* is a patronymic honoring E. A. Preble who collected the type specimen.

On the basis of skull morphology, *Sorex preblei*, with *S. cinereus*, *S. lyelli*, and *S. fontinalis*, was considered a member of the *cinereus* group (Findley, 1955; Jackson, 1928). Van Zyll de Jong (1991:70) remarked that "morphologically, *preblei* has its closest affinity to the southern short-rostrum morphotypes of *S. cinereus* (*fontinalis* and *lesueuri*). Based on Rogers' genetic similarity and distance values, *S. preblei* was placed in a clade with *S. cinereus*, *S. haydeni*, *S. fontinalis*, and *S. longirostris* (George, 1988).

We thank S. B. George, T. E. Tomasi, D. F. Williams, and G. L. Kirkland, Jr. for commenting on an earlier draft of the manuscript. This is Technical Paper No. 9652, Oregon Agricultural Experiment Station.

LITERATURE CITED

ARMSTRONG, F. H. 1957. Notes on *Sorex preblei* in Washington state. The Murrelet, 38:6.

BAILEY, V. 1936. The mammals and life zones of Oregon. North American Fauna, 55:1-416.

CARRAWAY, L. N., AND B. J. VERTS. 1988. Relative brain size in some western *Sorex*. The Southwestern Naturalist, 33:386-388.

—. In press. Relationship of mandibular morphology to relative bite force in some *Sorex* from western North America. Carnegie Museum of Natural History, Special Publication, 16.

FINDLEY, J. S. 1955. Speciation of the wandering shrew. Uni-

versity of Kansas Publications, Museum of Natural History, 9: 1-68.

GEORGE, S. B. 1988. Systematics, historical biogeography, and evolution of the genus *Sorex*. *Journal of Mammalogy*, 69:443-461.

HALL, E. R. 1981. The mammals of North America. Second ed. John Wiley & Sons, New York, 1:1-600 + 90.

HANSEN, C. G. 1956. An ecological survey of the vertebrate animals on Steen's Mountain, Harney County, Oregon. Ph.D. dissert., Oregon State College, Corvallis, 199 pp.

—. 1964. Ectoparasites of mammals from Oregon. *The Great Basin Naturalist*, 24:75-81.

HARRIS, A. H., AND L. N. CARRAWAY. In press. *Sorex preblei* from the Late Pleistocene of New Mexico. *The Southwestern Naturalist*.

HOFFMANN, R. S., AND R. D. FISHER. 1978. Additional distributional records of Preble's shrew (*Sorex preblei*). *Journal of Mammalogy*, 59:883-884.

HOFFMANN, R. S., AND D. L. PATTIE. 1968. A guide to Montana mammals: identification, habitat, distribution and abundance. University of Montana, Missoula, 133 pp.

HOFFMANN, R. S., P. L. WRIGHT, AND F. E. NEWBY. 1969. The distribution of some mammals in Montana. I. Mammals other than bats. *Journal of Mammalogy*, 50:579-604.

INGLES, L. G. 1965. Mammals of the Pacific states: California, Oregon, and Washington. Stanford University Press, Stanford, California, 506 pp.

JACKSON, H. H. T. 1922. New species and subspecies of *Sorex* from western America. *Journal of the Washington Academy of Science*, 12:262-264.

—. 1928. A taxonomic review of the American long-tailed shrews (genera *Sorex* and *Microsorex*). *North American Fauna*, 51:1-238.

JAECER, E. C. 1978. A source-book of biological names and terms. Third ed. Charles C Thomas, Publisher, Springfield, Illinois, 323 pp.

JUNGE, J. A., AND R. S. HOFFMANN. 1981. An annotated key to the long-tailed shrews (genus *Sorex*) of the United States and Canada, with notes on Middle American *Sorex*. *Occasional Papers, Museum of Natural History, University of Kansas*, 94: 1-48.

LARRISON, E. J., AND D. R. JOHNSON. 1981. *Mammals of Idaho*. University Press of Idaho, Moscow, 166 pp.

MULLICAN, T. R., AND L. N. CARRAWAY. 1990. Shrew remains from Moonshiner and Middle Butte caves, Idaho. *Journal of Mammalogy*, 71:351-356.

PORTS, M. A., AND S. B. GEORGE. 1990. *Sorex preblei* in the northern Great Basin. *The Great Basin Naturalist*, 50:93-95.

TOMASI, T. E., AND R. S. HOFFMANN. 1984. *Sorex preblei* in Utah and Wyoming. *Journal of Mammalogy*, 65:708.

VAN ZYLL DE JONG, C. G. 1991. Speciation in the *Sorex cinereus* group. Pp. 65-73, in *The biology of the Soricidae* (J. S. Findley and T. L. Yates, eds.). The Museum of Southwestern Biology, University of New Mexico, Albuquerque, 91 pp.

VERTS, B. J. 1975. New records for three uncommon mammals in Oregon. *The Murrelet*, 56:22-23.

VERTS, B. J., AND L. N. CARRAWAY. 1984. Keys to the mammals of Oregon. O.S.U. Book Stores, Inc., Corvallis, Oregon, 178 pp.

WILLIAMS, D. F. 1984. Habitat associations of some rare shrews (*Sorex*) from California. *Journal of Mammalogy*, 65:325-328.

Editors of this account were GUY N. CAMERON and KARL F. KOOPMAN. Managing editor was CRAIG S. HOOD.

J. E. CORNELY, U.S. FISH AND WILDLIFE SERVICE, P.O. BOX 25486, DENVER FEDERAL CENTER, DENVER, COLORADO 80225; L. N. CARRAWAY AND B. J. VERTS, DEPARTMENT OF FISHERIES AND WILDLIFE, NASH HALL 104, OREGON STATE UNIVERSITY, CORVALLIS 97331-3803.